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ON RELATIONS.

PURE mathematics has often been defined as *the science of abstract relations*, that is, of relations abstracted from entities, from qualities and from quantities. If such it be there is a question whether it may consistently be termed a *science*. Science, however, is not only the analytical and comprehensive knowledge of entities existing in relations; it is also the theoretic statement of the *relations* in which and by which the entities exist. If the relations can be abstracted from their relata and treated abstractly, that is a *method* of science or of philosophy, or even an abstract science of the relations; but according to the hypothesis it is not a science of the relations as subsisting among entities, and still less a science of entities. Those who hold that science is knowledge of *entities* would regard the methodical, analytical, or mathematical treatment of abstract relations as a branch of logic or of philosophy but not as a science. Philosophy also is largely a rational theoretic statement and critical discussion of relations among entities. Recently it has become so in a more especial sense than ever before. Philosophy, it would now seem, cannot proceed without further discussion of relations. A brief study of the logic of relations is therefore a proper propædeutic.

The attempt to define relation in general, or in the abstract, has usually led to the admission that whatever is meant by it is indefinable in simpler terms, irreducible in logic and in metaphysics, as are entity, element, and substance. It seems valid in logic to generalize relation, but in metaphysics and in science it is with the plural, *relations*, that thought and knowledge are engaged. Relations are *not* entities, nor elements; they are *not* the substantive terms; they are *predicative* to substantive terms, or to entities. The terms,[1] or entities, to which the relations are predicative are not predicative of their relations; they do not define them. Yet language has distinctive and attributive terms for most relations, and these may indeed be used as grammatical and as logical substantives. That is terminology, however, not definition, even though the linguistic term that names a relation denotes one or both of the logical terms thereby related. Thus the relation between part and whole is named the *part-whole relation*, and the relation between subject and object is termed the *subject-object relation;* the relation of the volume of a gas to the temperature and the pressure may be termed the *volume-pressure relation*, and the relation of history to geography may for convenience be called the *geographical relation*, yet these names do not define or describe the relations, though as names they may signify definite classes and imply definition, as definition may summarize description. So the complex relations of woman to social organization may briefly be termed *the woman question*, but that term does not define either what woman is or what the question is. Nor does any term, whether linguistic or logical, *define* the relation which it denotes or into which it enters. Hence relations are indefinable in simpler substantive terms.

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[1] It is regrettable that this word is so often used ambiguously, now for entity, now for name. Here it intentionally makes the transition between " substantive terms, or entities," and " linguistic terms," and " names," in the following sentences. Hereafter *term* will more consistently be distinguished from *entity* and from *relatum*.

But predicatively relations may be defined; distinctive predicative terms may state in what the relations are predicative to their relata. It may then be validly stated that *all relations subsist among entities or elements, and all entities subsist in relations. There can be no entity without relations;* absolute being without *any* relations is unknowable, inconceivable. How could an entity be known or conceived without entering at least the relation of being known or conceived, that is, a relation of some kind to knowing subjects? Wholly unknowable and inconceivable entity could not subsist in any ulterior universe, nor in any metaphysical system, without *some* relation to such system or to its parts. The very terms system, universe, imply relations; and to deny all relations in any metaphysics would be to contradict the terms of our logic.

Relation implies entities; *there can be no relation without relata, entities related.* A mathematical point may be regarded as consisting in relations and nothing else; but, if so defined, it would be a mere position, not an entity; nor would the geometrical line, consisting of points, be a real entity, nor the geometrical square, nor the cube, nor any geometrical configuration of relations, though of course the graphical representations of such would be entities and material. It seems convenient, however, even if not quite consistent, to extend the term *entity* to the field of geometry, even to points and lines, whether graphically represented or merely ideal, and to regard a point as a geometrical element.

Relations, subsisting among elements, are with them constitutive of complex entities. The only entity that is conceived as existing without parts is a mathematical point, and that is conceived as an element existing in geometrical relations, and constitutive of geometrical entities. In entities having parts there must be relations among the parts. Properties, or qualities, are not substantive entities, nor elements, but are predicative of relations internal to the entities and affecting other and external entities. *There can be no composite entity without internal and constitutive relations.*

Again, relations are constitutive of entities, the parts, or elements, or components of which they relate. Conversely, entities are constituted of components and relations. To the complex entities the components and the relations are *internal.* To the components those same relations are *external. A relation may be internal to a complex but external to the elements or components of that complex.* An obvious corollary is that the relations of a thing may some of them be external and some of them internal. A complex may have external relations to other external things, and these relations, external to the things of lower order of complexity or organization, would be internal to the more comprehensive complexes thus constituted; and so forth through all the spheres of the universe of entities subsisting and existing in relations. More briefly, *a relation may be external to one complex while it is internal to another.* The terms *external* (*extrinsic*) and *internal* (*intrinsic*), *or constitutive*, are thus *relative* to the order of complexity, or to the sphere of existence penetrated by the analysis.

These predications have prepared the way for a definition in substantive, though not in simpler terms: *Relations are modes of existence, in which entities exist and by which entities are constituted into more complex entities.*

Relations always constitute with the entities or elements that they relate complex entities predicatively different from the relata. Thus the things *A* and *B* in a relation *r* compose a complex entity *ArB*, which is different from *A* and from *B*, and in which the complex *Ar* differs predicatively from the relata, from *A* and from *B*, and in which the complex *rB* likewise differs from the relata. For a concrete example, the handle of a tool is one thing; the handle *and* its relation to a hand is a complex other than either handle or hand, and other than that special relation of handle to hand; the handle *in* the hand and the hand *holding* the handle are complexes logically different, both predicatively and substantively, from handle and from hand and from the special relation. It is the relation that renders these complexes different from the relata.

We should avoid confusing the thing *A* with the complex *Ar* or with the relation *r*, for, as was said above, they are three different things. There is a question whether the relation enters or becomes part of the relata and whether these are thus modified by the relations. From this question has arisen the controversy whether relations are *always* internal to their relata or *always* external. As in most controversy, there has probably been too much opposition on both sides. It is not so much a question whether relations in general enter into the constitution of things in general, for it is usually admitted that they do; it is rather a question whether the thing is the same with the relation, or in it, as it is without it.[1] The answer depends upon

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[1] Professor Perry in his *Present Philosophical Tendencies*, p. 319, has stated this opposition very moderately: " But according to the theory of the externality of relations, terms acquire from their new relations an added character, which does not either condition, or necessarily alter, the character which they already possess."

"According to the contrary view, relations penetrate, possess, and compromise their terms, so that it is impossible to separate the terms from the relation without destroying them."

" The procedure of logic and mathematics—any procedure, in fact, which employs the method of analysis—is necessarily committed to the acceptance of the what is meant by 'the same.' If *same* means continuously identical in constitution of parts and *internal* relations, in properties and *inherent* attributes, then the hand *is* the same, and the handle *is* the same, whether they are in the special conditioning relation or not; but the *action* of the hand and the *function* and the *utility* of the handle are by virtue of this relation what they were *not* when the hand and the handle were separate. It is to the action, function, utility, or other resulting complex that the special relation is internal or constitutive; to the attributive, functional, potential complex Ar, or to rB, the relation r is internal, that is, the relation modifies the properties or potential functions of the hand, or of the handle, and *adds* to what may be attributed to either; and it is likewise internal to the actual, completed complex ArB, to the terms of which it is not merely attributive but predicative. In other words, the hand becomes *effectually* changed by its holding the handle, and the handle becomes *virtually* changed by entering the hand. Yet hand and handle, A and B, remain physically and *internally* the same, flesh and wood, active and passive, agent and instrument.[1]

This brings us back to the statement that some of the relations of a thing may be internal and some of them external, and that a relation may be internal to one complex, or in one aspect, and external to or in another. As there are degrees of complexity for entities, so there are degrees of complexity or complicity for relations. Some relations, such as that of radius to circle, are comparatively simple, or may be described in simple or familiar terms. Other relations, for instance, that of terrestrial tides to the attraction and the position of the moon, are very compli-

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externality of relations. The method of analysis presupposes that the nature and arrangement of the parts supplies the character of the whole. If such were not the case the specification of the parts and their arrangement would not afford a description of the whole, and one would have to be content with an immediate or mystical apprehension of it."

[1] In another aspect the externality of relations to the attributes or qualities of the relata is stated by Mr. Bertand Russell: "The view I advocate is, that a term *a* may have a relation to a term *b* without there being any constituent of *a* corresponding to this relation. If this were false, simple terms could have no relations and therefore could not enter into complexes; . . ." *Journal of Philosophy, v. 8, p. 159.*

cated. Some indeed, such as the relation of the demand for pork to the supply, can not be extricated and completely analyzed, can not be conveniently or scientifically formulated. The statement of such complicated relations is theory involving hypotheses, conventions, and approximations. Then some relations are more general, that is, they are found in a broader range of various things, or phenomena, as the relation of demand to supply, in general, or the relation of weight to mass, or of name to class. Other relations, whether simple or complex, are special to definite classes of things, and may be defined in specific predications, or with specific terms, for instance, the relation of a mosquito to what we call a mosquito 'bite.' And some relations may be quite individual.

Philosophers may argue that, as a thing can not be completely or even adequately known or described apart from its relations, these are in that sense internal and constitutive. The distinctions drawn in the foregoing paragraphs may perhaps help to clear our thoughts of that confusion of relata with relations.[1] An illustration may show, furthermore, how common sense and indeed all science are dependent upon such distinctions being sustained. This acorn in my hand is, let us assume, an object existent in reality. It is *conditioned* by external relations, spatial, temporal, causal, and perceptual, yet it is apprehended as discrete, as defined by bounds, as confined by its exterior, and as constitutionally distinct from other things, with which it has evident external relations, from my hand, from the tree out of whose bud it developed, from the sunshine whose energy has been stored in its tissues. We need not forget, nor deny, these exterior and ulterior relations, but to comprehend them now as part of the acorn or as constitutive of it as an *acorn*, or to apprehend the acorn as but an incomplete part of the tree, or of the universe, would be very inconvenient, would be as poetically transcendent to present thoughts and purposes as it would be to previse here the potential oak-tree that might arise if the seed were planted, or to see in our little acorn the future timber that shall fortify a ship's side against an angry sea.

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[1] For instance, there is something like confusion in the following: "A relation then may be described as the whole situation into which the terms which stand in the relation enter; so far, of course, as the situation concerns the relation." . . . " Now if a relation means the whole relevant situation into which the terms enter, there can be no entry into the relation distinct from the relation itself." S. Alexander, *Mind*, N.S., v. 21, pp. 307 and 313.

Yet our acorn is internally complex. Let us turn to the microscope and the molecule. We enter here a universe of infinitesimals. The unit is no longer the acorn, but the cell, the atom, the electron. To these the constitutive relations are external. If we could analyze the atom and the electron, we should probably find that they too are constituted within and within of internal elements and motions and relations. But in a method of such omniscient comprehensions the human intellect may be dazzled by too many lights, the reason overstrained by the glare of illumination. It is not strange that those philosophers who maintain the internal theory of relations in its extreme statement should sometimes seek relief in the penumbra of a mystified metaphysics or in the ineffable twilight of poetry. In this view all things are interrelated and interpenetrated by their relations, everything entangled in an infinity of relations, which ramify to the bounds of the universe; nothing can be separated by analysis, nothing distinctly known, nothing comprehensively described, not until knowledge is as complete as the universe is unitary. Things are mere centers of perception or attention, and science is merely a tissue of convenient conventions and approximations, an imperfect makeshift. Thus the internal theory of relations issues in an anti-intellectualist philosophy.[1] Here is a rallying-ground for the neo-vitalist, for the intuitionist, and for the mystic. The philosopher Bergson and the scientist Driesch are too scientific themselves to intend utterly to disparage science, but some of their intrinsically poetic writings seem likely to mislead followers, who may not only write metaphysics poetically but may habituate their reason to revel in poetic imaginations.

It is scientific, also philosophic, and indeed poetic, to conceive that all things are complexes of internal elements and relations, existing in relations that are external to them while internal to larger complexes, that all things are relative, that relations are all constitutive, and that the constitution of things is unitary, the universe. In fact to deny this is unscientific and unphilosophic. *Pace*, pluralists. If we avoid confusing entities with their relations, and with the complexes of which the entities and their relations are constitutive, we may, however, analyze and define things as discrete, without negating either relativity or unity. Each thing being a component of a more comprehensive complex, we may analyze the more comprehensive in terms of the more elementary, and the elements we may describe as parts of the complex. But the terms and the definitions should denote only the complexes whose logical extension they comprehend. And the external which *conditions* an entity should be distinguished from the internal which is *constitutive* of it.

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[1] Prof. E. G. Spaulding in his "Defense of Analysis" in *The New Realism* (pp. 164–169), has criticised this theory very acutely.

In our perceptual and analytical knowledge we are dealing with objects that appear as discrete and with terms that are accepted as definite. What the term *acorn* denotes is the class of objects of specific form, constitution, and properties. Internal and external relations may be connoted or implicit, but in the term they are not explicit, nor in any simple predication or judgment into which the term may enter. It is convenient and it is logical to use the term as definite for this distinct class of objects. The very purpose of terms is to delimit definite denotations. The definition tends to include some of the external relations; "the relations tend, with familiarity, to become attributes of their *relata*."[1] But this tendency should not lead to the confusion of the terms with their external relations; for it is inconvenient, and if the tendency is carried to the extreme it is impossible for thought in its various processes and operations to support the burden of everywhere comprehending *all* the relations that may subsist in the reality of the universe.

Terms and definitions, it is true, are only means in the development of knowledge, and analysis and description apply especially to the comprehensive mode. Immediate apprehension of things in their concreteness, their flux and change, and the intuitive beliefs and interpretations of the human mind may indeed afford us more vivid, intimate, and satisfactory knowledge of reality. Not too much, however, should be made of the difference between the apprehensive and the comprehensive mode; and, so far as biological and intellectual values are relevant, the conceptual and comprehensive knowledge is no less valuable to life than is the intuitive and perceptual, while it tends to become of even higher value to intelligence. This synthetic, comprehensive knowledge depends upon consistency in terms and in definitions.

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[1] Tawney, PHILOSOPHICAL REVIEW, Vol. XXII, p. 303.

To confuse a thing with one of its relations, to think that A, or B, is r, is less unpardonable than to confuse one relatum with its correlate, that is, to mistake A for B. Thus, to assert that the line between two points is the relation between them, as did the philosopher James,[1] is hardly less erratic than to declare that the line is the distance. *The distance-in-that-direction* is the special relation between the two points; but the line is not that relation, it is not the distance; it is the graphical, or the metrical, correlate having its own other relation to that relation of the distance. In these cases we are dealing with confusions of relata with their correlates. It is by similar confusions that certain 'new realists' and 'radical empiricists' merge the conscious state with the objective entity with which it is correlated, or knowledge with the thing known, or the experience with that of which there is experience.

The way has now been prepared for a consideration of relations of dependence. That relations are constitutive of entities implies that complex entities are dependent on the relations as well as on the relata. That the entities are dependent on their constituents is not, however, reason for saying that those constituents are all dependent upon one another within their complex, that the parts are dependent on the whole, or on one another. But what is meant here by *dependent?* Are related entities always dependent on one another? These questions go very deeply, involving the logic of causation and contingency, and the constitution of all systems and of the universe. If 'in relation with' and 'constituted of' meant dependent on, everything would be dependent on everything else and on all relations, and nothing would be extricable or distinct. This use of the term 'dependent' in its most extensive sense would be in keeping with the extreme doctrine that all relations are internal, as held by certain philosophers.

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[1] William James, *Principles of Psychology*, v. 2, pp. 149–150.

But that doctrine we have rejected. Nor is it admitted here that relation *always* implies dependence, that every thing is dependent (in a proper sense of the term) upon all the things to which it is related. That every thing is dependent on *some* thing is indeed an ontological postulate verified throughout the domains of science. On the other hand, that some things are independent of certain other things is quite consistent with knowledge and with terminology. A more positive distinction may now validly be stated. Things are not all dependent upon all other things in the universe, even though they be all interrelated. A thing *A* may be in a relation *r* to another thing *B* without being dependent on *B*. This is especially apparent in such abstract relations as those of mere likeness or analogy or position. A white-oak tree might be in the peculiar relation to another white-oak tree of being antipodal by precise measurement, so that the two trees would stand out from the extremities of a diameter of the earth; but this relation would in no wise make them dependent on each other for anything in the nature of oak-trees. If there is any kind of dependence in this relation, it must be more sophistical than significant. If similarity and analogy are kinds of relation (and are they not usually regarded as such?), then the arm of a derrick is related to the arm of any man, though it is dependent upon those arms only that made it and those that are working it. And the relation of equality does not render the equal things dependent on one another, nor does the relation of distance, however small, unless some other relation to some other thing determine some direct or partial dependence. Two cities in proximity may be dependent on each other in many ways, not by reason of the nearness itself, but through economic relations resulting from the proximity. Relatedness does not always imply dependence of the relata on one another.

Dependence is not a status subsistent in a special kind of relation in which one thing is necessary to the existence of the other thing as such. If the one cannot exist without the other, the dependence is *complete;* but if destroying or changing the relation, or one of the relata, produces a corresponding change or variation in the other relatum, the dependence is *partial* or *variable.* For instance, the relation of the candle-flame to the candle is completely dependent; for, when the candle is consumed, the flame ceases. Yet dependence is seldom so simple as in this instance. Even here the flame is dependent on other things also, on a supply of oxygen, on the match that lights the candle, on the hand that applies the match, and so through the degrees of contingency. Many of the facts and happenings of life and of history are reducible to this type of dependence upon an 'efficient cause,' interrelated with many contingent causes. The candle too has its history, and for its qualities the candle-flame depends upon the special properties of the candle and its materials. And the action of the hand that lights the candle has also its history of contingencies too intricate to be traced and apparently endless. The sinking of the steamship Titanic was directly caused by her striking that particular iceberg, but it was dependent also upon a net of contingencies which determined that the icebergs should have drifted to that latitude and longitude and that that particular low-lying iceberg should have been at that moment in the steamship's path; and why she had not taken the safer course farther south, and why her speed had not been reduced when warnings had been received, and why she was in danger of that kind of iceberg and that kind of collision, and so forth through the maze of whys and wherefores. This is the type of the accident with a history conditioning it. It may be contrasted with the type of a history with a salient accident upon which the causation turns and seems chiefly to depend. The conquest of England by William the Norman depended mainly upon England's being in that special state of disorganization and upon the aggressive ambition and vindictive character of William. That Harold was shipwrecked and that under William's compulsion he made promises which soon afterward he broke, these are accidental and contingent.

Between these two types of historical happening there are all possible intermediate kinds of complex contingency, in life, in history, and in science.

The relation of the tree to its shadow on the snow exemplifies another kind of dependence, which may be termed *dual*, as contrasted with the candle-flame, which exists in *simple*, *complete* dependence on the candle, though changeable by various *contingent* relations. The shadow is completely dependent not only on the tree but on the sunlight. Its changes depend indeed on the changing position of the sun. It has, however, other variable relations with the intensity of the light and the contour of the ground on which it falls. So there is constant change in the shadow's branches or tracery on the snow. Here also many interrelated contingencies condition the presence of the tree and the sunlight and the snow.

An interesting type of contingent dependence is that of lock and key. This is the type of *constant, or permanent physical correlation of the parts of two complex things*, whether natural or constructed by art. Apart from its key, the lock is a lock and is *structurally* complete; and the key is a complete key apart from its lock. But there is a structural relation between this particular key and that particular lock. The locksmith would say that the lock were incomplete without the key, as the builder would say that the door were incomplete without the lock; but what they are thinking of are the complexes, door-with-lock and lock-with-key. As was said before, the components should not be confused with the complexes. Now suppose the door has never been locked to debar entry, that the key has never been turned in the lock, but has lain in a drawer. The door and the lock would still be structurally related, and the lock and the key would still be structurally correlated, but the relations would then be of not actual but merely *virtual* dependence. The relation of the lock to the door would become actually dependent on the relation of the key to the lock, if a hand were actuated by a purpose to lock the door. This contingent dependence may be symbolized by $Hr''Kr'LrD$, and is thus *triple*, while the dependence on each term is complete. The permanent physical correlation of the key with the lock is, however, the most significant part of the complex relation. There is also a contingent dependence upon the adjustment of the door to its jamb. Thus a relation of dependence may be itself dependent upon other relations of dependence, or a relation may imply contingent dependence, or things may be dependent in one relation whereas in other relations or conditions of change they may be non-dependent or but *virtually* dependent. Natural science is replete with instances of similar physical, structural and functional correlations, in which complete dependence is contingent or virtual.

Another type is that of complete dependence upon a variable quantitative relation. For instance, the soap-bubble blown from the clay-pipe by a child depends upon the pipe as the candle-flame depends upon the candle, but it also depends upon the comparatively constant pressure of the child's breath and the steadiness with which the pipe is held. A little jerk and the bubble bounds away from the pipe and drifts into the air. It floats so far and no farther. The liquid film evaporates; the surface tension can no longer retain the gaseous contents, and the bubble dissolves in a breath of the breeze. Beyond a certain limit of pressure the bubble would burst at the pipe and vanish. Here we have variable quantitative relations of complete and of partial dependence. Mathematics and physics are largely occupied with such relations.

To the physiological and psychological correlations with physical entities another type is intermediate. The rainbows in the misty spray of a fountain are contingently dependent upon a special relation of refracted sunlight to the spray. The *rainbow-light* is completely dependent upon the spray playing into the sunlit air, and variably dependent upon the changing sunlight shining about the fountain. When the sun is shining brightly there and the misty spray is in the sunlight, we may say that rainbows are there a plenty, but they are unseen till the children come there and from all possible angles find them and delight in them. As optical phenomena, rainbows have this duality of aspect. The physical entity and the physical relations constitute what we called the 'rainbow-light.' This itself is of dual dependence on sunlight and on spray, is quantitatively and contingently dependent on the dispersion of the light by the drops of spray. The physiologico-psychological relations, the peculiarities of the eyes, the angles of vision, and the chance and changing positions of the children in their motions, and the psychological variations of sensation, these too are of dual dependence, and are virtual or contingent. In this complex relation we have duality of relations themselves of dual dependence; and it is typical of physiological and psychological phenomena of stimulus and response, of all things seen, and heard, and felt, and of all things known. Surely, in the face of such common duality, we should not fear the terms *dualism* and *correlation.*

If all entities subsist in relations and if relations are constitutive of complex entities, the question remains, are relations real? The relations that are constitutive of real entities should be regarded as real, or the entities would be real as respects their components and non-real as respects their constitutive relations. That would be a confusing consequence. One would hardly know whether to regard a candle-flame in relation to its candle as less real than the candle without the flame, or indeed as less real than the candle-flame without the candle; and the celebrated smile of the Cheshire cat would indeed be more real without the cat than with the cat. To deny categorically that relations are real would render the term *real* not only one of the vaguest but one of the most valueless in philosophy.

We should not, however, hypostasize relations as though they were entities. That would be as bad as to confuse them with their relata. They may be apprehended or comprehended in various degrees of knowledge, they may be perceived or conceived in various modes or situations, they may be expressed or represented by various means or methods; yet they have not existence as have entities and qualities. Relations are not easily cognized or conceived apart from their relata; and some things can hardly be separated in thought from their external relations; yet relations are neither complexes of components nor of qualities; they may be real, but they are not existent. From the psychological view, ". . . the relation itself becomes a special conscious content distinct from the contents which are related, though indeed inseparably connected with them."[1] That this distinct content is not merely ideal is more explicit in the following statements by the psychologist Angell: ". . . that the consciousness of relation is a basal factor in all activities of attention; that our attention is sometimes more, and sometimes less, directed toward the extant *relations* than toward the *things* related; but that no moment of cognitive consciousness is wholly lacking in the awareness either of relations or objects."[2] James, merging reality in experience, is quite explicit in asserting that relations are real: ". . . *the relations that connect experiences must themselves be experienced relations, and any kind of relation experienced must be accounted as 'real' as anything else in the system.*"[3]

The relation of contact of two bodies is as immediately apprehended as are the bodies themselves, or the qualities of the bodies; and it seems consistent to state that the contact is as real as the bodies are. Of course there may be a mere optical appearance of contact relative to the position from which two bodies are seen; but then the relation is not one of contact but of *apparent contact.* Contact moreover is physically relative, and is qualifiable in thought. The relation of the acorn to the oak-tree is in this sense real only when the acorn is on its twig; when the acorn is in my hand, its relation to the tree is ideal, or conceptual, or remembered. This is not to say that the same relation may now be real, now ideal; for these two cases imply two *different* relations; the relation of *the acorn on its twig* to the tree is real; the relation of *the acorn in my hand* to the tree is ideal, or conceptual. But in cases of virtual or contingent dependence a realizable relation may be cognized as real, or converted into a real relation. There may be an ideal relation of rainbow to fountain, or contingently a realizable relation, or conditionally a real relation of the refracted rainbow-light to the fountain's spray.

Relations would thus appear in dual aspects; they would be regarded as real in the constitution of real entities, whether known or unknown, and in perception and attention; in conception and in thought, in judgment and in reasoning, they would be regarded as ideal, as subsisting in the relating tendency of the mind. When the relata are not apparently connected or dependent, or the dependence is unknown or virtual, the relations may appear to be ideal rather than real. This duality of aspect and this apparent vacillation between reality and ideality arise from similar duality in consciousness and in knowledge, and similar vacillation between the cognition of reality and the cognition of ideality. But the relations themselves are some constantly real and some constantly ideal, as the entities they relate are some real and some ideal. Ideal and conceptual relations are contrasted with real relations as ideas and concepts are contrasted with realities. Yet underlying all is the universal reality.

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[1] Wundt, *Outlines of Psychology* (1897), p. 250.

[2] J. R. Angell, *Psychology*, 4th ed., p. 248.

[3] *Essays in Radical Empiricism*, p. 42. (The italics are his own emphasis.)

In general most relations are real, though some are merely ideal. In their reality, however, as in their being, they are different both from entities and from ideas; they differ from entities in that they are not existent; from ideas they differ in that they are real, or, if ideal, are but *constitutive of or attributive to* ideal complexes or complex ideas, are not simple ideational or cognitive elements; however complex, they are attributive or predicative to their relata; yet they may be substantive in logic, as they are in grammar. Relations that are constitutive of real entities are real in that they are involved in the reality of the entities; relations that are constitutive of ideal or conceptual entities are ideal or conceptual, unless they are apprehended as real. An ideal complex or comprehensive concept may be partly composed of real entities and real relations. The concepts of science are thus composite of real and empirical elements in rational combination with conceptual relations and ideal entities. Relations that are external to real entities may be real. Unknown entities existing in relations are real, if their existence can be verified; and their external relations, if these can be verified, are also real. Ideal entities too may have their external relations, and these may either be ideal or be real, be conceptual or be perceptual.

This doctrine that in general relations may be and mostly are real can not be definite until reality has been defined; yet in treating of relations it seems proper to answer these questions, for we shall find that reality itself cannot be discussed comprehensively without reference to the relation of subject to object and the relation of entities to being and to existence.

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